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Antibacterial activity of roots of *Cicer arietinum* Linn.

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ABSTRACT

Cicer arietinum is a potent medicinal plant in the Indian systems of medicine. Traditionally it is used as antibacterial, antifungal, antipyretic, antidiarrhoeal etc. In the present study the hydroalcoholic extract and its acetone and methanol fractions of the root of *C. arietinum* were studied for their antibacterial activity by disc diffusion method against different gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and gram negative (*Escherchia coli*) bacteria. It was observed that the hydroalcoholic extract and its acetone and methanol fraction showed significant activity against all the microorganisms tested here and the hydroalcoholic extract showed the highest activity (13 mm) against *S. aureus*.

Key words: *Cicer arietinum*, disc-diffusion method, antibacterial activity, minimum inhibitory concentration.

INTRODUCTION

Cicer arietinum Linn belonging to family Leguminosae is an annual herb that is spread into Southern Europe, India, Egypt and Southern America. It is extensively cultivated in India mainly in Rajasthan, Hyderabad, Patiala, East Punjab, Haryana and Madhya Pradesh. It needs warm and moist climatic conditions to propagate. Its black gram is native of India but the white species commonly called Kabuli came to India in 18th century from European countries and area like Afghanistan etc [1]. It contains good amount of carbohydrates in the seeds. Various proteins and minerals have also been found in it [2]. In India it is very often used as a crash diet and it is one

of the most widely made recipes in India kitchen due to its good taste and nutritive values. Traditionally it is used as antibacterial, antifungal, antipyretic, antidiarrhoeal etc [1]. The present study deals with the antibacterial activity of the hydroalcoholic extract, and its acetone and methanol fractions of the roots of the plant.

EXPERIMENTAL SECTION

Collection and authentication of plant material

The Plant *Cicer arietinum* was collected during February to March from different region of Haryana and authenticated through NISCAIR, New Delhi and a voucher specimen has been preserved for further references.

Preparation of extracts

The roots were dried under shade, coarsely powdered and the hydroalcoholic extract was prepared by maceration. Further the acetone and methanol fractions of the concentrated hydroalcoholic extract were prepared by using percolator.

Antibacterial activity

The antibacterial activity was evaluated by disc-diffusion method [3], [4]. The bacterial strains used were *E. coli* (NCIM - 2831), *S. aureus*, (NCIM - 2079) *B. subtilis* (NCIM - 2439). Nutrient agar media was taken in a pre-sterilized petri dish and the microorganisms were grown. The disc (7 mm) was saturated with 20 μ l of 5 mg/ml solution each of hydroalcoholic extract and its different fractions, allowed to dry and was introduced on the upper layer of the seeded agar plate and incubated at 37⁰C for 24 hrs. The diameters of zone of inhibition (mm) were recorded and the experiment was done in triplicate and the mean values are presented and compared with standard drug Amikacin. The minimum inhibitory concentration (MIC) of the different extracts and fractions was also determined according to standard method [5], [6] using a concentration range between 3.9-2000 μ g/disc.

RESULTS AND DISCUSSION

The hydroalcoholic extract, acetone fraction and methanol fraction of root of *Cicer arietinum* was tested and compared to that of Amikacin. The results of the sensitivity test are presented in Table 1 and Fig 1. It was found that the hydroalcoholic extract, acetone fraction and methanol fraction (100 μ g/disc) gave promising inhibitory activity against all the bacterial strain tested herein. The MIC value of hydroalcoholic extract, its acetone and methanol fractions was in the range of 7.8-31.2, 15.6-31.2 and 7.8-15.6 μ g/disc respectively (Table 2). Further, the hydroalcoholic extract and its fractions were found to contain carbohydrates, protein and amino acid, through preliminary photochemical screening [7]. The antibacterial activity may be due to one/more group of above phytoconstituents.

Table 1: Antibacterial Activity of *C. arietinum*

Test organism	*Zone of Inhibition in mm			Amikacin (30 μ g/disc)
	Different extracts (100 μ g/disc)			
	HE	AFHE	MFHE	
<i>E. Coli</i> (NCIM-2831)	12	12	11.5	19

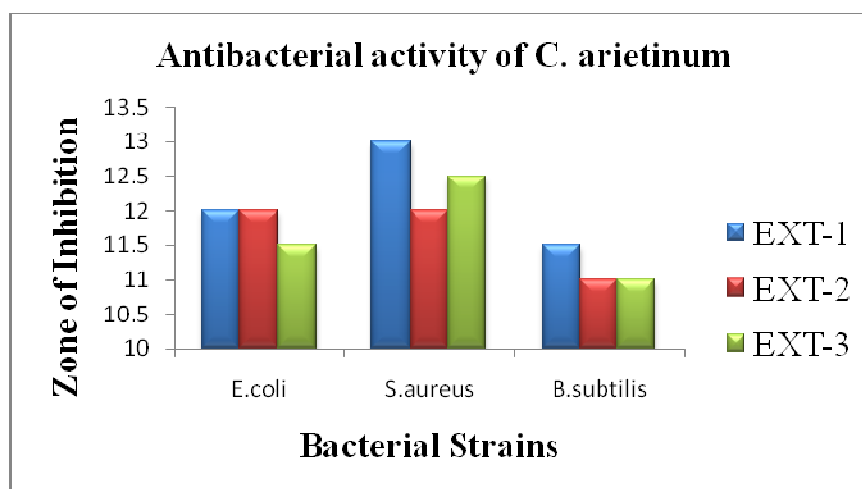
<i>S. Aureus</i> (NCIM-2079)	13	12	12.5	24
<i>B. Subtilis</i> (NCIM-2439)	11.5	11	11	20

HE, Hydroalcoholic extract; AFHE, Acetone fraction of HE; MFHE, Methanol fraction of HE; *average of three readings

Table 2: Minimum Inhibitory Concentrations (MIC) Values of *C. arietinum* Against Pathogenic Bacteria

Test organism	Diameter of inhibition zone in mm(Concentration in µg/disc)									
	Hydroalcoholic Extract									
	2000	1000	500	250	125	62.5	31.2	15.6	7.8	3.9
<i>S. Aureus</i>	16	15	14.5	14	13	12.5	12	11.5	8.5	00
<i>E. Coli</i>	14	13.5	13	12.5	12	11.5	11	9.5	00	00
<i>B. Subtilis</i>	14.5	14	13	12.5	11.5	11	00	00	00	00
Acetone fraction										
<i>S. Aureus</i>	15	14.5	13.5	13	12.5	11.5	11	00	00	00
<i>E. Coli</i>	15.5	14.5	14	13.5	13	12	11.5	8.5	00	00
<i>B. Subtilis</i>	14	13.5	13	12.5	11.5	11	00	00	00	00
Methanol fraction										
<i>S. Aureus</i>	15	14.5	13.5	13	12.5	12	11.5	11	7.5	00
<i>E. Coli</i>	14.5	14	13	12.5	12	11.5	11	00	00	00
<i>B. Subtilis</i>	15.5	15	14.5	13.5	12.5	11.5	11	8.5	00	00

Fig. 1: Antibacterial Activity by Hydroalcoholic Extract and Different Fraction of *C. arietinum*



EXT-1 = Hydroalcoholic extract, EXT-2 = Acetone fraction, EXT-3 = Methanol fraction

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